PIER DEMAND RESPONSE RESEARCH CENTER

Research Opportunity Notice DRRC RON – 03

Understanding Customer Behavior to Improve Demand Response Delivery in California

January 19, 2007

Research Goal

The purpose of this Research Opportunity Notice (RON) is to solicit proposals for research that will advance the scientific understanding of customer behavior related to demand response. The first RON goal is that the insights from the research will inform both PIER and private sector technology development. The second goal is that results will lead to the increased adoption of Demand Response programs and activities that will have a significant role in reducing electricity demand in the State of California from 2008-2012.

This research is part of the California Energy Commission's PIER Demand Response Research Center (DRRC), which was formed to develop, prioritize, conduct, and disseminate multi-institutional research that develops broad knowledge to facilitate demand response.

Background

The Demand Response Research Center characterizes Demand Response (DR) as the "short-term modifications in customer end-use electrical loads in response to dynamic price and reliability information." Even when these "modifications" are fully automated, there is still a series of human interventions that determine what gets done, when, by whom, and to whom. Demand response is thus a process that involves a chain of multiple actors interacting with a series of technologies, all designed to reduce electricity demand during critical periods. These diverse actors include utility regulators, utility program managers, commercial and industrial building owners, building managers, building occupants, as well as the millions of individual households, each with its own set of individual decision makers, which make up the decision chain of demand response.

Previous research has tested several hypotheses of how to best deliver demand response programs. These studies have broadened our limited knowledge base of why utility customers choose to participate in DR programs, and how they behave in these programs. Despite these efforts to understand how people understand and participate in DR programs, there is an increasing need by policy makers and program managers to better understand customer behavior in responding to demand response requests, in theory and in practice, in order to achieve greater demand savings for existing and future programs.

Research Methods and Approaches

The DRRC is looking for proposals that are innovative, collaborative and provide new insights into customer behavior. Ultimately, the expectation is that the research results will advance the state of knowledge about customer behavior and help utility program managers, regulators and policy implementers to design and manage Demand Response programs and activities that deliver significant demand savings.

Specifically, the DRRC is asking for proposals that will improve our understanding of customer behavior related to demand response, and the context in which this behavior is shaped and modified. Unlike much of the previous research in this area which addressed questions of the "what" and "who" of demand response, the DRRC also wants to know more about the "why" and "how" of customer behavior, e.g., why do customers participate in Demand Response programs? Reliability? Price? Off-setting need for new generation? And how do these values shift over time? How do people understand Demand Response, how do they make sense of it, and how does it fit into their priorities for taking action? How are people motivated by, or even understand, dynamic pricing, and what other factors are important to them?

In addition to these fundamental questions of how end users understand and make sense of Demand Response, we are interested in the ways that people employ new technologies that implement DR, e.g., what information and functionality do people want from these devices, and in what formats? One approach of interest is the "natural experiment" in which the behaviors of people are observed under realistic conditions. We want to understand what real people do under real conditions, and not just hypothetical behaviors, speculation, etc., which tell us what people might do, under imagined circumstances.

Proposals should build on the limited, but growing body of knowledge about social science and DR, illustrated by the references included in the bibliography to this Notice (see Appendix A). We welcome ideas that come from outside the energy arena, including behavioral economics, and social marketing, that can shed new light on the issues of technology adoption and customer behavior related to Demand Response. Innovation in ideas and methods are welcome, and we are looking for creative ways that these findings can be used by utility and policy makers. We encourage proposals that involve collaborative teams, drawing members from industry, academia, and other areas.

R&D Topic Areas and Research Questions

For this RON, the DRRC has identified four sectors as Topic Areas for further study. Proposals can address one aspect of a particular sector, one of these sectors, or multiple sectors if appropriate. These four topic areas are:

Topic Area 1: Residential Customers
Topic Area 2: Small Commercial Customers
Topic Area 3: Large Commercial
Topic Area 4: Industrial Customers

For each of these Topic Areas we provide a short description, as well as examples of questions that could be addressed by this RON. These examples are illustrative and not intended to limit creative scientific enquiry. We are not seeking proposals that simply survey customer responses to these questions or that compile a report of current knowledge on these questions.

Topic Area 1: Residential Customers

Residential utility customers are a major target for DR programs, particularly for households with large air conditioning loads, electric water heaters, and in-ground pools. Previous studies have addressed questions of user participation in DR pilots, user interaction with information technology, and other types of consumer feedback, including utility bills and smart thermostats.

Examples of the types of R&D questions that could be addressed in this RON include:

- What does DR mean to these customers? How do they make sense of it?
- Is customer response more connected to price, comfort, habit, inertia, altruism, environmental concerns, economic gain, economic loss, or something else?
- What are the underlying conceptual models, and specific factors that will make DR programs attractive to residential customers?
- What types of incentives motivate customers to join and persist?
- Why do residential customers choose to participate in DR programs?
- What type of information and feedback will residential customers respond to, and why?
- How willing are customers to allow technologies to act for them?
- What are the opportunities beyond residential air conditioning that customers will respond to?
- How do customers want to interact with new DR technologies?

Topic Area 2: Small Commercial Customers

Small commercial customers have been identified—rightly or wrongly—as a tough market for demand response programs, due, in part, to the diversity of building types, and the need to maintain comfort and normal business operations during demand response events. Previous studies have addressed questions of user participation in DR pilots, user interaction with information technology and other types of consumer feedback. We are particularly interested in proposals that address this underserved sector.

Examples of the types of R&D questions that could be addressed in this RON include:

- What does DR mean to these customers? How do they make sense of it?
- Why do small commercial customers choose to participate in DR programs?
- What will make DR programs attractive to small commercial customers?
- Which small commercial customers are likely to participate in DR programs?

- What type of information about rates, usage, feedback or technology will small commercial customers respond to, and why?
- How willing are customers to allow technologies to act for them?
- How do customers want to interact with new DR technologies?
- How do customers differentiate demand response from conservation, if they make such a distinction?

Topic Area 3: Large Commercial

Large commercial customers have been identified as an important market for demand response programs, but have been underrepresented in DR programs, due, in part, to the types of business operations that need to be maintained, such as retail operations, tenant comfort, hospitality, and recreation. Previous studies have addressed questions of user participation in DR pilots, user interaction with information technology and other types of consumer feedback.

Examples of the types of R&D questions that could be addressed in this RON include:

- What does DR mean to these customers? How do they make sense of it?
- What will make DR programs attractive to large commercial customers?
- Why do large commercial customers choose to participate in DR programs?
- How much demand response will customers meet? How many times for a given time period?
- What types of information, feedback or technology will large commercial customers respond to, and why?
- How willing are customers to allow technologies to act for them?
- How do customers want to interact with new DR technologies?

Topic Area 4: Industrial Customers

Industrial customers have been identified as a primary market for demand response programs, and represent some of the largest DR savings to date. Previous studies have addressed questions of user participation in DR pilots, user interaction with information technology and other types of consumer feedback.

Examples of the types of R&D questions that could be addressed in this RON include:

- What does DR mean to these customers? How do they make sense of it?
- What will make DR programs attractive to industrial customers?
- What types of incentives motivate customers to join and persist?
- Why do industrial customers choose to participate in DR programs?
- What types of information, feedback or technology will industrial customers respond to, and why?
- How willing are customers to allow technologies to act for them?
- How do customers want to interact with new DR technologies?

Funding levels and duration for this RON

The DRRC currently intends to fund up to $520k for this RON. This level would support 2-3 proposals of $150k-$250k each. The DRRC would also consider supporting smaller research projects that delve into one aspect thoroughly. Projects are envisioned to run up to 18 months, and would start in 2007 and end in 2008. Because of the limited funds for this work, DRRC is looking for proposals that include partnerships and cost-sharing that will leverage these funds.

Criteria for Evaluation of proposals

30% Potential impact of research. Does the research proposal address an important behavioral question, one that brings new knowledge to the problem of DR implementation, adoption or evaluation? What is the potential impact of the research on DR technology development, DR adoption, implementation or evaluation in California? Does the proposed work provide fundamental understandings and new insights that will benefit other DRRC research, utility programs, or other DR infrastructure and technology developments, e.g., advanced metering? How will the results from the work be delivered in order to maximize impact, e.g., interactive websites, experimental workshops, briefings, etc.?

30% Quality of research proposal. Does the proposal present a strong research plan? Is the work grounded in theory? How does the proposal build on previous research in this or related areas? Is the proposal innovative and directed towards providing new insights and understanding? Does the proposal employ "natural experiments" or other approaches that allow for real behaviors to be characterized?

30% Capability of team. What unique skills and perspectives does the team bring from social science or DR implementation? What previous work has the team accomplished in this, or related, areas? Does the team bring a mix of players that represents an effective partnerships with utilities, academia, industry and others, to carry out the proposed research? What are the relative amounts of time dedicated to the project from senior team members, junior support, and administrative staff?

10% Cost sharing. What additional resources does the team bring to the project, both in terms of hard and soft costs?

Appendix A: Bibliography

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